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1. (Amended) A method of processing a silicon substrate, comprising:

evacuating a vacuum chamber in which the substrate is placed to a first pressure,

introducing a fluid other than pure molecular oxygen into the vacuum chamber as a background fluid, and

implanting ions into the substrate to form a buried oxide layer under a top silicon layer, wherein the fluid inhibits formations of threading dislocations in the top silicon layer for reducing a defect density of the processed substrate.

2. The method according to claim 1, further including selecting the fluid from the group consisting of water vapor, heavy water, air, argon, and hydrogen gases.

3. The method according to claim 1, wherein the fluid is a hydrogen-containing fluid.

4. The method according to claim 1, wherein the fluid is a reducing agent.

5. The method according to claim 1, wherein the fluid is a surface oxide inhibiting agent.

6. The method according to claim 1, wherein the first pressure is less than about 1×10^{-5} Torr.

7. The method according to claim 1, wherein introducing the fluid into the vacuum chamber produces a second pressure in the vacuum chamber that is less than about 1×10^{-3} Torr.

8. The method according to claim 1, further including actively controlling the amount of fluid introduced into the vacuum chamber based upon a parameter measured in the chamber.

9. The method according to claim 8, further including selecting the parameter from the group consisting of pressure, water vapor/ion concentration, and temperature.

10. The method according to claim 8, wherein the parameter includes a measurement of an ion beam current.

11. The method according to claim 10, wherein the measurement includes a measurement of a decrease in the beam current due to the fluid in the chamber.

12. A method of processing a substrate, comprising:

- evacuating a vacuum chamber in which the substrate is placed to a first pressure;
- introducing a fluid into the vacuum chamber;
- implanting ions into the substrate using an ion beam to form a buried oxide layer under a top silicon layer;
- measuring a decrease in the ion beam current level due to the fluid in the chamber;
- and
- adjusting the fluid level based upon the measured ion beam current level.

13. The method according to claim 12, further including the step of selecting the fluid from fluids that inhibit formations of threading dislocations in the top silicon layer for reducing a defect density of the processed substrate.

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